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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/568,794

11/08/2006

Michael Murphy

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EXAMINER

HORNING, JOEL G

ART UNIT

PAPER NUMBER

1712

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/568,794	Applicant(s) MURPHY ET AL.	
	Examiner JOEL G. HORNING	Art Unit 1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 28 May 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,6-12,14-17,19 and 21-30 is/are pending in the application.
- 4a) Of the above claim(s) 1,3,4,6-12,14-17 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>02-17-06; 05-21-07; 09-18-09; 07-15-10</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group II, drawn to a method for treating substrates in the reply filed on May 28th, 2010 is acknowledged. The traversal is on the ground(s) that the newly amended claims share more common technical features than previously, overcoming the restriction requirement. This is not found persuasive at least because as applied the rejection below, Tobashi et al (US 2002/0009868) teaches all the features of claim 21, so there is no common technical feature that is a special technical feature.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "substantially proportional" in claim 27 is a relative term which renders the claim indefinite. The term "substantially proportional" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is uncertain how large of a misfit could exist between the values produced by the actual concentration as a function of radial distance and the best fit using a

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proportional function with the relationship still being considered "substantially proportional" and being met by the claim. Would a 60% or 80% fit still be considered substantially proportional, or is it "substantially proportional" if that produces a better fit than some other function, like an exponential function? The examiner is uncertain. For the purposes of examination, the examiner will consider the concentration variations in the applied art to be "substantially proportional" since they follow a proportional trend (increasing with distance from the axis) and could be approximated as a proportion, the fit just varies by differing amounts and a practitioner would not know when the fit would be poor enough for the applicant to consider it non-proportional.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 21-24 and 27-30** are rejected under 35 U.S.C. 102(b) as being anticipated by Tobashi (US 2002009868).
3. Regarding **claim 21**, as seen in figure 1 of Tobashi, in chamber **B**, a substrate support **41** is rotated about an axis by shaft **5**, while supporting substrate **A** so that the substrate surface is substantially perpendicular to the axis of rotation. A plurality of gas streams is introduced into said chamber, flowing substantially parallel to the axis of rotation as they are directed towards a surface of the substrate [0041]. It teaches making the velocity (momentum) of the gas so that it is substantially

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uniform, which is important in order to make the pressure uniform, which can improve the uniformity of the thickness and electrical properties of the deposited film. The process gas used in the gas streams is made by mixing a reactant gas with a carrier gas to dilute it to the desired concentration [0006-0007]. These gas streams are supplied to different concentric sections radial to the axis (inward portion of the substrate) (**claim 22**)[0028] and it teaches varying the concentrations in those radial sections further from the axis (the radially outward sections) have a higher reactant concentration than those closer to the axis (radially inward sections) (**claim 21**)[0018].

4. Regarding **claim 23**, the mechanism that adjusts the concentrations of the process gases (e.g. **8** and **9**) is positioned before the carrier and reactant gases exit the inlets [0042] and, as discussed above, the different inlets have different concentrations.
5. Regarding **claim 24**, Tobashi teaches depositing epitaxial films from the reactant gas using their process [0011].
6. Regarding **claim 27**, as discussed previously, the concentration increases as a function of radial distance, so as discussed in the 112 rejection above, it is considered “substantially proportional.” Additionally, as shown in figure 1, along a radius, there are only two inlets. This means that there are only two different process gas concentrations. Any two points can be approximated by a line, that is as a function with a constant proportion perfectly fitting them. This too could be

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considered "substantially proportional" and so is interpreted to meet the claim limitation.

7. Regarding **claim 28**, as shown in figure 1, the gases flow parallel to the axis into the concentration adjusting region **8** or **9**, where the reactants are mixed with the carrier gas to the desired concentration before they are flowed to the substrate. Mixing will necessarily occur in this region once the carrier gas and reactant gas are no longer physically separated (that is they will mix just after they are discharged from the inlets, because the end of the inlet is reasonably defined to be where the gases are no longer entering but are in the mixing zone). As discussed previously the resulting concentration in these regions is adjusted to be different from each other. Thus all the limitations are fairly taught by Tobashi.
8. Regarding **claim 29**, as seen in figure 1, Tobashi further teaches having a porous injection plate **3** between the inlets and the substrate support, so that the mixed gas streams exit from the downward facing side of the injection plate [0004].
9. Regarding **claim 30**, Tobashi wants the surface to have a uniform layer thickness (abstract). It is readily apparent that a region of the surface layer grows by the amount that the surface region receives. In order to produce, during the time of deposition, a uniform thickness layer over the entire substrate, the layer must have been growing at the same rate over the entire substrate. Thus if the surface is growing at a uniform rate over its entirety (e.g. $1\text{g}/(\text{cm}^2\text{s})$), it is receiving substantially the same amount of reactant per unit area per unit time and the process meets the claim limitation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. **Claim 25** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tobashi (US 2002009868), as applied previously, in view of Fujii (US 4980204).

As discussed previously, Tobashi teaches using reactant gases in their CVD process, but it does not specifically teach using an alkyl reactant. However, Fujii is also directed towards depositing CVD films using a vertical rotary reactor with a reactant and a diluent (carrier) gas. It teaches using organic reactants as the precursors for the film (col 1, lines 7-37), including specifically metal alkyl precursors like trimethyl indium (col 1, lines 66-67).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use an metal alkyl compound as the reactant gas, since such

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compounds were known to be suitable reactant gases for such CVD reactors and would produce predictable results (**claim 25**).

11. **Claim 26** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tobashi (US 2002009868), as applied previously, in view of Ruehrwein (US 4010045).

As discussed previously, Tobashi teaches using a carrier gas with its reactant gas, but does not exemplify using nitrogen as that gas. The only example given is using hydrogen gas [0006]. Ruehrwein is also directed towards depositing epitaxial layers using CVD methods where the reactant gas is mixed with a carrier gas (abstract). However, Ruehrwein further teaches that hydrogen is commonly used as a carrier gas in such CVD processes, but that it produces several handling and safety problems because it is highly reactive. In order to avoid these problems, Ruehrwein teaches using inert or non-reactive gases as the carrier gas, including nitrogen gas (col 1, lines 32-55).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use nitrogen gas as a carrier gas in the general process described by Tobashi in order to avoid safety and handling problems that results from using hydrogen as a carrier gas, and furthermore since it was generally known to be desirable for use as a carrier gas in such CVD processes and would produce predictable results (**claim 26**).

Conclusion

No current claims are allowed.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1712
12.
/Michael Cleveland/

Supervisory Patent Examiner, Art Unit 1712

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